

Spectral Instrument Using Multiple Non-Interfering Optical Beam Paths and Elements For Use
Therewith.

Dkt. No. IL0116-SPEC

Serial No. 09/728,247

IN THE CLAIMS

Please amend the claims as follows.

Listing of Claims:

1. (Currently Amended) A spectrometer system, said system comprising:

a spectral instrument wherein said spectral instrument comprises means for ~~detecting~~
receiving optical wavelength energy; means for performing functions upon ~~detected~~ received
optical energy said functions being selected from the group consisting of receiving, refracting,
reflecting, absorbing, directing, diffracting, dispersing, diffusing, focusing, chopping, filtering,
detecting, amplifying, analyzing, comparing, and displaying; said functions performed being
those of optical devices and optical instruments, said optical devices being selected from the
group consisting of slits, splitting devices, prism devices, mirror devices, chopping devices,
lenses and gratings, and said instruments being selected from the group consisting of
monochromator, spectroradiometer, spectrophotometer and a spectral energy source; and

a power module comprising means for providing to said spectral instrument, operating
power, means for communicating, means for interconnecting said spectral instrument with a
means for controlling said means for performing functions by said spectral instrument.

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1 2. (Currently Amended) The spectrometer system according to claim 1 further comprising
2 means for receiving commands from a list of commands, said means for receiving commands
3 being at least one communications port located as part of said means for communicating and
4 means for responding to each of said commands, said commands of said list of commands
5 consisting of at least one command selected from the group consisting of power on and off, scan
6 wavelengths including selection of start wavelength and end wavelength, read and display
7 measured data, instrument calibration and validation, and cage drive mechanism.

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1 3. (Original) The spectrometer system according to claim 1 further comprising software
2 operable on a computer, said software providing means for remotely accessing, controlling
3 functions, controlling performance, and controlling measurement and characterizing of measured
4 data developed by said spectral instrument.

1 4. (Original) The spectrometer system according to claim 2 further comprising software operable
2 on a computer, said software providing means for remotely accessing, controlling functions,
3 controlling performance, and controlling measurement and characterizing of measured data
4 developed by said spectral instrument.

1 5. (Currently Amended) The spectrometer system according to claim 1 further comprising means
2 for comparing data developed by said spectral instrument when performing functions of one of
3 said instruments, said means for comparing data being part of said means for controlling said
4 means for performing functions by said spectral instrument.

1 6. (Currently Amended) The spectrometer system according to claim 2 3 further comprising
2 means for comparing data developed by said spectral instrument when performing functions of
3 one of said instruments, said means for comparing data being part of said means for controlling
4 said means for performing functions by said spectral instrument.

1 7. (Currently Amended) The spectrometer system according to claim 4 further comprising
2 means for comparing data developed by said spectral instrument when performing functions of
3 one of said instruments, said means for comparing data being part of said means for controlling
4 said means for performing functions by said spectral instrument.

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1 8. (Currently Amended) The spectrometer system according to claim 7 further comprising
2 programmable electronics and means to indicate malfunction located within said spectral
3 instrument and connected to said power module and said means for communicating; wherein said
4 means for indicating malfunction comprises at least one indicator light having an on state and an
5 off state and connected to said programmable electronics, and wherein said programmable
6 electronics control said state of said at least one indicator light wherein said state of at least one
7 indicator light is related to said malfunction in said spectral instrument, such that a user can
8 quickly determine if there is power or communication to the system.

1 9. (Original) The spectrometer system according to claim 1 further comprising means to control
2 said means for performing functions wherein said means for control comprises:
3 a set of commands, each command of said set of commands being transmitted to said means
4 for communicating, wherein each command of said set of commands instructs said spectral
5 instrument to perform a certain function of said functions; and
6 a micro-computer and control circuitry incorporated into said spectral instrument for
7 receiving said commands, interpreting said commands, and directing said spectral instrument to
8 perform said certain function based on which said command is received.

1 10. (Currently Amended) The spectrometer system according to claim 1, wherein said spectral
2 instrument further comprises:
3 a plurality of optical components, ~~each component of said plurality of optical components~~
4 ~~being particularly~~ each of which is oriented and located each with respect to the others, wherein
5 such that some selected optical components function to direct and define a plurality of beam paths
6 ~~for an~~ at least one optical beam of energy which enters said spectral instrument, and other
7 ~~selected~~ optical components function to alter the nature of said optical beams ~~of energy which~~
8 ~~enter said spectral instrument~~, wherein each said beam paths are used concurrently and

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9 simultaneously and in a non-interfering manner by said optical beam traveling over said beam
10 paths; and wherein said optical components comprise

11 at least one optical device that modifies said at least one optical beam, creating a modified
12 optical beam, and directs said modified optical beam on a first beam path to a splitter device
13 having a first entrance slit through which said modified optical beam passes resulting in an
14 entrance slit beam;

15 said entrance slit beam is passed onto a prism device then onto a grating from which said
16 entrance slit beam is diffracted, thereby becoming a reflected beam;

17 said reflected beam is passed back to said prism device which then passes said reflected
18 beam to a lens device and then to a first exit slit through which said reflected beam passes to an
19 optical chopper device;

20 said optical chopper device chops said reflected beam into a chopped beam and directs said
21 chopped beam to a mirror device which creates a mirror image beam and passes said mirror
22 image beam on a second beam path through a second input slit and back to said lens device;

23 said lens device directs said mirror image beam back to said prism device and then back to
24 said grating which then directs said mirror image beam again back to said prism device and to a
25 second exit slit which directs said mirror image beam again back to said splitter device;

26 said splitter device then redirects said mirror image beam to a second lens device which
27 directs said mirror image beam to a filter assembly, thereby creating a filtered beam which is then
28 directed to a filter exit aperture and into a detector which is communicatively connected to said
29 means for controlling; thus a plurality of beam paths are created and used simultaneously yet non-
30 interferingly by and in said spectral instrument.

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2 11. (Currently Amended) The spectrometer system according to claim 2, wherein said spectral
3 instrument further comprises:

4 a plurality of optical components, each component of said plurality of optical components
5 being particularly each of which is oriented and located each with respect to the others, wherein
6 such that some selected optical components function to direct and define a plurality of beam paths

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6 for ~~an~~ at least one optical beam of energy which enters said spectral instrument, and other
7 ~~selected~~ optical components function to alter the nature of said optical beams ~~of energy which~~
8 ~~enter said spectral instrument~~, wherein ~~each~~ said beam paths are used concurrently and
9 simultaneously and in a non-interfering manner by said optical beam traveling over said beam
10 paths; and wherein said optical components comprise

11 at least one optical device that modifies said at least one optical beam, creating a modified
12 optical beam, and directs said modified optical beam on a first beam path to a splitter device
13 having a first entrance slit through which said modified optical beam passes resulting in an
14 entrance slit beam;

15 said entrance slit beam is passed onto a prism device then onto a grating from which said
16 entrance slit beam is diffracted, thereby becoming a reflected beam;

17 said reflected beam is passed back to said prism device which then passes said reflected
18 beam to a lens device and then to a first exit slit through which said reflected beam passes to an
19 optical chopper device;

20 said optical chopper device chops said reflected beam into a chopped beam and directs said
21 chopped beam to a mirror device which creates a mirror image beam and passes said mirror
22 image beam on a second beam path through a second input slit and back to said lens device;

23 said lens device directs said mirror image beam back to said prism device and then back to
24 said grating which then directs said mirror image beam again back to said prism device and to a
25 second exit slit which directs said mirror image beam again back to said splitter device;

26 said splitter device then redirects said mirror image beam to a second lens device which
27 directs said mirror image beam to a filter assembly, thereby creating a filtered beam which is then
28 directed to a filter exit aperture and into a detector which is communicatively connected to said
29 means for controlling; thus a plurality of beam paths are created and used simultaneously yet non-
30 interferingly by and in said spectral instrument.

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12. (Currently Amended) The spectrometer system according to claim 4, wherein said spectral instrument further comprises:

a plurality of optical components, ~~each component of said plurality of optical components being particularly~~ each of which is oriented and located ~~each with respect to the others, wherein~~ such that some selected optical components function to direct and define a plurality of beam paths for an at least one optical beam of energy which enters said spectral instrument, and other selected optical components function to alter the nature of said optical beams of energy which enter said spectral instrument, wherein each said beam paths are used concurrently and simultaneously and in a non-interfering manner by said optical beam traveling over said beam paths; and wherein said optical components comprise

at least one optical device that modifies said at least one optical beam, creating a modified optical beam, and directs said modified optical beam on a first beam path to a splitter device having a first entrance slit through which said modified optical beam passes resulting in an entrance slit beam;

said entrance slit beam is passed onto a prism device then onto a grating from which said entrance slit beam is diffracted, thereby becoming a reflected beam;

said reflected beam is passed back to said prism device which then passes said reflected beam to a lens device and then to a first exit slit through which said reflected beam passes to an optical chopper device;

said optical chopper device chops said reflected beam into a chopped beam and directs said chopped beam to a mirror device which creates a mirror image beam and passes said mirror image beam on a second beam path through a second input slit and back to said lens device;

said lens device directs said mirror image beam back to said prism device and then back to said grating which then directs said mirror image beam again back to said prism device and to a second exit slit which directs said mirror image beam again back to said splitter device;

said splitter device then redirects said mirror image beam to a second lens device which directs said mirror image beam to a filter assembly, thereby creating a filtered beam which is then directed to a filter exit aperture and into a detector which is communicatively connected to said

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29 means for controlling; thus a plurality of beam paths are created and used simultaneously yet non-
30 interferingly by and in said spectral instrument.

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1 13. (Currently Amended) The spectrometer system according to claim 8, wherein said spectral
2 instrument further comprises:

3 a plurality of optical components, ~~each component of said plurality of optical components~~
4 ~~being particularly~~ each of which is oriented and located each with respect to the others, wherein
5 such that some selected optical components function to direct and define a plurality of beam paths
6 for an at least one optical beam of energy which enters said spectral instrument, and other
7 ~~selected optical components function to alter the nature of said optical beams of energy which~~
8 ~~enter said spectral instrument, wherein each~~ said beam paths are used concurrently and
9 simultaneously and in a non-interfering manner by said optical beam traveling over said beam
10 paths; and wherein said optical components comprise

11 at least one optical device that modifies said at least one optical beam, creating a modified
12 optical beam, and directs said modified optical beam on a first beam path to a splitter device
13 having a first entrance slit through which said modified optical beam passes resulting in an
14 entrance slit beam;

15 said entrance slit beam is passed onto a prism device then onto a grating from which said
16 entrance slit beam is diffracted, thereby becoming a reflected beam;

17 said reflected beam is passed back to said prism device which then passes said reflected
18 beam to a lens device and then to a first exit slit through which said reflected beam passes to an
19 optical chopper device;

20 said optical chopper device chops said reflected beam into a chopped beam and directs said
21 chopped beam to a mirror device which creates a mirror image beam and passes said mirror
22 image beam on a second beam path through a second input slit and back to said lens device;

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23 said lens device directs said mirror image beam back to said prism device and then back to
24 said grating which then directs said mirror image beam again back to said prism device and to a
25 second exit slit which directs said mirror image beam again back to said splitter device;

26 said splitter device then redirects said mirror image beam to a second lens device which
27 directs said mirror image beam to a filter assembly, thereby creating a filtered beam which is then
28 directed to a filter exit aperture and into a detector which is communicatively connected to said
29 means for controlling; thus a plurality of beam paths are created and used simultaneously yet non-
30 interferingly by and in said spectral instrument.

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1 14. (Currently Amended) The spectrometer system according to claim 9, wherein said spectral
2 instrument further comprises:

3 a plurality of optical components, ~~each component of said plurality of optical components~~
4 ~~being particularly~~ each of which is oriented and located each with respect to the others, wherein
5 such that some selected optical components function to direct and define a plurality of beam paths
6 for an at least one optical beam of energy which enters said spectral instrument, and other
7 ~~selected optical components function to alter the nature of said optical beams of energy which~~
8 ~~enter said spectral instrument, wherein each~~ said beam paths are used concurrently and
9 simultaneously and in a non-interfering manner by said optical beam traveling over said beam
10 paths; and wherein said optical components comprise

11 at least one optical device that modifies said at least one optical beam, creating a modified
12 optical beam, and directs said modified optical beam on a first beam path to a splitter device
13 having a first entrance slit through which said modified optical beam passes resulting in an
14 entrance slit beam;

15 said entrance slit beam is passed onto a prism device then onto a grating from which said
16 entrance slit beam is diffracted, thereby becoming a reflected beam;

17 said reflected beam is passed back to said prism device which then passes said reflected
18 beam to a lens device and then to a first exit slit through which said reflected beam passes to an
19 optical chopper device;

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20 said optical chopper device chops said reflected beam into a chopped beam and directs said
21 chopped beam to a mirror device which creates a mirror image beam and passes said mirror
22 image beam on a second beam path through a second input slit and back to said lens device;
23 said lens device directs said mirror image beam back to said prism device and then back to
24 said grating which then directs said mirror image beam again back to said prism device and to a
25 second exit slit which directs said mirror image beam again back to said splitter device;
26 said splitter device then redirects said mirror image beam to a second lens device which
27 directs said mirror image beam to a filter assembly, thereby creating a filtered beam which is then
28 directed to a filter exit aperture and into a detector which is communicatively connected to said
29 means for controlling; thus a plurality of beam paths are created and used simultaneously yet non-
30 interferingly by and in said spectral instrument.

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1 15. (Original) A spectral instrument for performing analysis of spectral energy of an input optical
2 beam, said input optical beam having a wavelength distribution and an energy distribution, said
3 spectral instrument comprising:

4 a first monochromator portion comprising a first entrance slit said first entrance slit in
5 optical beam path relationship with a grating component, a first exit slit in diffracted and
6 wavelength selected beam path relationship with a first reflective surface of said grating
7 component; and

8 a second monochromator portion comprising a second entrance slit, said second entrance
9 slit being in a mirror image optical beam path relationship with a return mirror and with said
10 grating component, a second exit slit in twice diffracted and twice wavelength selected beam path
11 relationship with a second reflective surface of said grating component, said optical beam paths
12 of said first monochromator portion and said second monochromator portion being substantially
13 non-interfering.

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1 16. (Original) The spectral instrument for performing analysis of spectral energy of an input
2 optical beam according to claim 15 further comprising means for chopping at a predetermined
3 chop rate, any optical beam within both said first monochromator portion and said second
4 monochromator portion, said means for chopping positioned in optical beam path relationship
5 with said first exit slit and said return mirror and said return mirror and said second entrance slit
6 of said second monochromator portion.

1 17. (Original) The spectral instrument for performing analysis of spectral energy of an input
2 optical beam according to claim 15 further comprising means for moving said grating component
3 thereby selecting the wavelength discriminated by both said first monochromator and said second
4 monochromator.

1 18. (Original) The spectral instrument for performing analysis of spectral energy of an input
2 optical beam according to claim 16 further comprising means for moving said grating component
3 thereby selecting the wavelength discriminated by both said first monochromator and said second
4 monochromator.

1 19. (Original) A spectral instrument for performing analysis of spectral energy of an input optical
2 beam, said input optical beam having a wavelength distribution and an energy distribution, said
3 spectral instrument comprising:

4 a first entrance slit upon which an entrance optical beam, derived from said input optical
5 beam, is directed in a first path, said first entrance slit creating thereby a first entrance slit beam,
6 said first entrance slit beam having a cross section dimensions substantially equal to the cross
7 section dimensions of said first entrance slit;

8 a first location on a prism first reflecting surface upon which said entrance slit beam is
9 directed in a second path, said prism first reflecting surface directs said entrance slit beam on a
10 third path to a grating component, said entrance slit beam thereby being diffracted by said grating

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11 component creating a first diffracted beam which first diffracted beam is reflected in a fourth path
12 from said grating component surface to a first location on a prism second reflecting surface;

13 field lens upon which said first diffracted beam is directed on a fifth path from said prism
14 second reflecting surface focuses and directs said first diffracted beam and a defined and selected
15 portion of the optical spectrum of said first diffracted beam onto a first exit slit, said first exit slit
16 thereby discriminating and producing a narrow bandwidth beam of optical wavelengths;

17 return mirror upon which said narrow bandwidth beam is directed on a sixth path, said
18 return mirror creating a mirror image beam of said narrow bandwidth beam and directing on a
19 seventh path said mirror image beam to said field lens;

20 second entrance slit upon which said mirror image beam is directed on an eighth path by
21 said field lens providing discrimination of said mirror image beam;

22 a second location of said prism second reflecting surface upon which said discriminated
23 mirror image beam is directed, said prism second reflecting surface directs on a ninth path, said
24 discriminated mirror image beam to said grating component, said discriminated mirror image
25 beam being diffracted by said grating component creating a diffracted discriminated mirror image
26 beam which diffracted discriminated mirror image beam is reflected on a tenth path from said
27 grating component surface to a second location on said prism first reflecting surface; and

28 a second exit slit upon which said second location on said prism first reflecting surface
29 directs on an eleventh path, said diffracted discriminated mirror image beam providing a second
30 discrimination of said diffracted mirror image beam.

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1 20. (Original) The spectral instrument for performing analysis of spectral energy of an input
2 optical beam according to claim 19 further comprising means for chopping at a predetermined
3 chop rate said first diffracted beam and said mirror image beam.

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1 21. (Original) The spectral instrument for performing analysis of spectral energy of an input
2 optical beam according to claim 19 further comprising means for moving said grating component
3 thereby selecting the wavelength discriminated by both said first exit slit and said second exit slit.

1 22. (Original) The spectral instrument for performing analysis of spectral energy of an input
2 optical beam according to claim 20 further comprising means for moving said grating component
3 thereby selecting the wavelength discriminated by both said first exit slit and said second exit slit.

1 23. (Original) The spectral instrument for performing analysis of spectral energy of an input
2 optical beam according to claim 19 further comprising:
3 a turning mirror directing therefrom, said diffracted discriminated mirror image beam
4 into an instrument output portion: and
5 input optics, said input optics selected from the group consisting of a wide-angle lens, a
6 narrow-angle lens and fiber optics.

1 24. (Original) The spectral instrument for performing analysis of spectral energy of an input
2 optical beam according to claim 20 further comprising a turning mirror directing therefrom, said
3 diffracted discriminated mirror image beam into an instrument output portion: and
4 input optics, said input optics selected from the group consisting of a wide-eyed lens, a
5 narrow-eyed lens and fiber optics.

1 25. (Original) The spectral instrument for performing analysis of spectral energy of an input
2 optical beam according to claim 22 further comprising a turning mirror directing therefrom, said
3 diffracted discriminated mirror image beam into an instrument output portion: and
4 input optics, said input optics selected from the group consisting of a wide-eyed lens, a
5 narrow-eyed lens and fiber optics.

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1 26. (Currently Amended) The spectral instrument for performing analysis of spectral energy of
2 an input optical beam according to claim 23 further comprising:

3 a detector positioned in said instrument output portion upon which detector said
4 diffracted discriminated mirror image beam is directed;

5 a detector amplifier for amplifying said detected information; and

6 means for communicating said amplified detected information to a ~~use~~ user of said
7 spectral instrument.

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1 27. (Currently Amended) The spectral instrument for performing analysis of spectral energy of
2 an input optical beam according to claim 24 further comprising:

3 a detector positioned in said instrument output portion upon which detector said
4 diffracted discriminated mirror image beam is directed;

5 a detector amplifier for amplifying said detected information; and

6 means for communicating said amplified detected information to a ~~use~~ user of said
7 spectral instrument.

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1 28. (Currently Amended) The spectral instrument for performing analysis of spectral energy of
2 an input optical beam according to claim 25 further comprising:

3 a detector positioned in said instrument output portion upon which detector said
4 diffracted discriminated mirror image beam is directed;

5 a detector amplifier for amplifying said detected information; and

6 means for communicating said amplified detected information to a ~~use~~ user of said
7 spectral instrument.

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1 29. (Original) The spectral instrument for performing analysis of spectral energy of an input
2 optical beam according to claim 27 wherein said detector amplifier is a lock-in amplifier.

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1 30. (Original) The spectral instrument for performing analysis of spectral energy of an input
2 optical beam according to claim 21 further comprising means for optical initialization and a
3 means for verification of wavelength using a known wavelength source directed, on-axis, to said
4 grating component and detected by an initialization detector.

1 31. (Original) The spectral instrument for performing analysis of spectral energy of an input
2 optical beam according to claim 22 further comprising means for optical initialization and a
3 means for verification of wavelength using a known wavelength source directed, on-axis, to said
4 grating component and detected by an initialization detector.

1 32. (Original) The spectral instrument for performing analysis of spectral energy of an input
2 optical beam according to claim 25 further comprising means for optical initialization and a
3 means for verification of wavelength using a known wavelength source directed, on-axis, to said
4 grating component and detected by an initialization detector.

1 33. (Original) The spectral instrument for performing analysis of spectral energy of an input
2 optical beam according to claim 28 further comprising means for optical initialization and a
3 means for verification of wavelength using a known wavelength source directed, on-axis, to said
4 grating component and detected by an initialization detector.

1 34. (Original) The spectral instrument for performing analysis of spectral energy of an input
2 optical beam according to claim 21 wherein said means for moving said grating component
3 comprises:

4 a stepping motor having a motor shaft output end; and

5 a means for automatic caging of said grating during shipping comprising

6 a fixed anti-backlash magnet having a fixed magnet first opposing side and a fixed magnet
7 second opposing side and a fixed magnet shaft recess, said fixed magnet first opposing side
8 affixed to said motor shaft output end;

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9 a slip-coupled anti-backlash magnet having two opposing sides, a slip magnet first
10 opposing side and a slip magnet second opposing side, and a slip magnet shaft recess, said slip
11 magnet first opposing side facing said fixed magnet second opposing side;

12 a flexible torsion drive shaft having a proximal end and a distal end, said proximal end
13 disposed within said fixed magnet shaft recess and said slip magnet shaft recess; and

14 a worm drive at said distal end of said flexible torsion drive shaft, said worm drive
15 engaged with gears such that rotation of said worm drive causes an arcuate movement of said
16 grating.

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1 35. (Original) The spectral instrument for performing analysis of spectral energy of an input
2 optical beam according to claim 22 wherein said means for moving said grating component
3 comprises:

4 a stepping motor having a motor shaft output end; and

5 a means for automatic caging of said grating during shipping comprising

6 a fixed anti-backlash magnet having a fixed magnet first opposing side and a fixed magnet
7 second opposing side and a fixed magnet shaft recess, said fixed magnet first opposing side
8 affixed to said motor shaft output end;

9 a slip-coupled anti-backlash magnet having two opposing sides, a slip magnet first
10 opposing side and a slip magnet second opposing side, and a slip magnet shaft recess, said slip
11 magnet first opposing side facing said fixed magnet second opposing side;

12 a flexible torsion drive shaft having a proximal end and a distal end, said proximal end
13 disposed within said fixed magnet shaft recess and said slip magnet shaft recess; and

14 a worm drive at said distal end of said flexible torsion drive shaft, said worm drive
15 engaged with gears such that rotation of said worm drive causes an arcuate movement of said
16 grating.

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1 36. (Original) The spectral instrument for performing analysis of spectral energy of an input
2 optical beam according to claim 25 wherein said means for moving said grating component
3 comprises:

4 a stepping motor having a motor shaft output end; and

5 a means for automatic caging of said grating during shipping comprising

6 a fixed anti-backlash magnet having a fixed magnet first opposing side and a fixed magnet
7 second opposing side and a fixed magnet shaft recess, said fixed magnet first opposing side
8 affixed to said motor shaft output end;

9 a slip-coupled anti-backlash magnet having two opposing sides, a slip magnet first
10 opposing side and a slip magnet second opposing side, and a slip magnet shaft recess, said slip
11 magnet first opposing side facing said fixed magnet second opposing side;

12 a flexible torsion drive shaft having a proximal end and a distal end, said proximal end
13 disposed within said fixed magnet shaft recess and said slip magnet shaft recess; and

14 a worm drive at said distal end of said flexible torsion drive shaft, said worm drive
15 engaged with gears such that rotation of said worm drive causes an arcuate movement of said
16 grating.

1 37. (Original) The spectral instrument for performing analysis of spectral energy of an input
2 optical beam according to claim 28 wherein said means for moving said grating component
3 comprises:

4 a stepping motor having a motor shaft output end; and

5 a means for automatic caging of said grating during shipping comprising

6 a fixed anti-backlash magnet having a fixed magnet first opposing side and a fixed magnet
7 second opposing side and a fixed magnet shaft recess, said fixed magnet first opposing side
8 affixed to said motor shaft output end;

9 a slip-coupled anti-backlash magnet having two opposing sides, a slip magnet first
10 opposing side and a slip magnet second opposing side, and a slip magnet shaft recess, said slip
11 magnet first opposing side facing said fixed magnet second opposing side;

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12 a flexible torsion drive shaft having a proximal end and a distal end, said proximal end
13 disposed within said fixed magnet shaft recess and said slip magnet shaft recess; and

14 a worm drive at said distal end of said flexible torsion drive shaft, said worm drive
15 engaged with gears such that rotation of said worm drive causes an arcuate movement of said
16 grating.

1 38. (Original) The spectral instrument for performing analysis of spectral energy of an input
2 optical beam according to claim 31 wherein said means for moving said grating component
3 comprises:

4 a stepping motor having a motor shaft output end; and

5 a means for automatic caging of said grating during shipping comprising

6 a fixed anti-backlash magnet having a fixed magnet first opposing side and a fixed magnet
7 second opposing side and a fixed magnet shaft recess, said fixed magnet first opposing side
8 affixed to said motor shaft output end;

9 a slip-coupled anti-backlash magnet having two opposing sides, a slip magnet first
10 opposing side and a slip magnet second opposing side, and a slip magnet shaft recess, said slip
11 magnet first opposing side facing said fixed magnet second opposing side;

12 a flexible torsion drive shaft having a proximal end and a distal end, said proximal end
13 disposed within said fixed magnet shaft recess and said slip magnet shaft recess; and

14 a worm drive at said distal end of said flexible torsion drive shaft, said worm drive
15 engaged with gears such that rotation of said worm drive causes an arcuate movement of said
16 grating.

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1 39. (Original) The spectral instrument for performing analysis of spectral energy of an input
2 optical beam according to claim 32 wherein said means for moving said grating component
3 comprises:

4 a stepping motor having a motor shaft output end; and

5 a means for automatic caging of said grating during shipping comprising

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5 a fixed anti-backlash magnet having a fixed magnet first opposing side and a fixed magnet
7 second opposing side and a fixed magnet shaft recess, said fixed magnet first opposing side
8 affixed to said motor shaft output end;

9 a slip-coupled anti-backlash magnet having two opposing sides, a slip magnet first
10 opposing side and a slip magnet second opposing side, and a slip magnet shaft recess, said slip
11 magnet first opposing side facing said fixed magnet second opposing side;

12 a flexible torsion drive shaft having a proximal end and a distal end, said proximal end
13 disposed within said fixed magnet shaft recess and said slip magnet shaft recess; and

14 a worm drive at said distal end of said flexible torsion drive shaft, said worm drive
15 engaged with gears such that rotation of said worm drive causes an arcuate movement of said
16 grating.

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1 40. (Original) A method for using a spectral system for measuring and transmitting spectral
2 energy data in the form of a spectrum derived from wavelength data characteristic of a stream of
3 electromagnetic radiation, said spectral system being controlled by a plurality of commands, said
4 spectral system having; at least one function, a plurality of calibration operations, automatic
5 caging capability, manual filter control, and a shutter, said method comprising:
6 powering up said spectral system; initializing said spectral system; calibrating said spectral
7 system;
8 commanding said spectral system to perform functions comprising; reading said spectral energy
9 data, scanning said spectral energy data, integrating said spectral energy data over time,
10 displaying said spectral energy data, requesting status of said spectral system, stopping an
11 ongoing command, performing automatic caging of means for causing said scanning, reading
12 temperature, calibrating said spectral system, opening shutter, closing shutter, controlling a
13 selection of order sorting filters, and entering "sleep" mode;
14 receiving from said spectral system, said spectral energy data read by said spectral system;
15 interpreting said received data; and powering down said system.